

The artesian well water level fell during the month from 34.85 to 34.75 feet above mean sea level. April 30, 1902, it stood at 34.10. The average daily mean sea level for the month was 9.65 feet, the assumed annual mean being 10.00 feet above datum. For April, 1902, it was 9.75.

Trade wind days, 27, (1 NNE.); normal, 20; average force of wind during daylight, Beaufort scale, 3.2. Average cloudiness, tenths of sky, 5.1; normal, 5.1.

Approximate percentages of district rainfall as compared with normal: Hilo, 185; Hamakua, 185; Kohala, 185; Waimea, 112; Kona, 145; South Kau, 80; North Kau, 140; Puna, 155; Maui, 150, except Kula, only 16; Oahu, town, 80; Koolau, 175; elsewhere on the island, 130; Kauai, 150, except Hanalei, 240. The heaviest 24-hour rainfalls for the month were at Nahiku (800), 7.08, 29th; Puuohua, 5.39 and Kapoaha, 5.30 on the 15th. Heaviest monthly rainfall Puuohua, 48.85.

Mean temperature table.

| Stations. | Eleva-tion. | Mean max. | Mean min. | Cor. avge. |
|--|-------------|-----------|-----------|------------|
| | Feet. | ° | ° | ° |
| Pepeekeo | 100 | 74.1 | 66.4 | 70.3 |
| Waimea | 2,730 | 66.9 | 56.3 | 61.0 |
| Kohala | 521 | 74.6 | 64.1 | 68.7 |
| Waiakea | 2,700 | 78.7 | 55.7 | 66.5 |
| United States Magnetic Station | 50 | 81.5 | 65.6 | 73.0 |
| United States Experimental Station | 350 | 78.1 | 66.2 | 71.5 |
| W. R. Castle | 60 | | | 71.3 |
| Hilo | 40 | 81.0 | 65.9 | 72.8 |

Kohala dew-point average, 68.7°; relative humidity, 84 per cent; Magnetic Station, 62.2° and 69 per cent; Ewa Mill, 60.5° and 58 per cent.

Heavy surf, 5th, 11-15th, 18th; lightning seen at Pepeekeo, 25th and 26th. light snow on Mauna Kea, 11th; slight earthquake at Hilo, 2 a. m., 19th.

An unusually large meteor passed over East Hawaii from the south at 5:30 a. m. on the 30th, seen at Hilo, North Hilo, Hamakua, and said to have been visible over Haleakala on Maui; though there may have been two distinct meteors. The noise of its passage was mistaken for thunder by the Pepeekeo observer and others. A fragment weighing over a ton is reported as having been found by a native in Kau, but no subsequent report has yet confirmed this.

RECENT PAPERS BEARING ON METEOROLOGY.

W. F. R. PHILLIPS, in charge of Library, etc.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a —.

Science. New York. N. S. Vol. 17.

Ward, R. DeC. Helm Cloud in the Blue Ridge of North Carolina. [Note on article of W. M. Davis.] P. 712.

Ward, R. DeC. Meteorological Phenomena of Volcanic Eruptions. [Note on article of R. B. White.] Pp. 712-713.

Ward, R. DeC. General Circulation of the Atmosphere. [Note on report of Dr. Hildebrandsson.] Pp. 752-753.

Scientific American. New York. Vol. 88.

— Origin of the Word "Barometer." [Note on article of Henry Carrington Bolton.] P. 395.

Scientific American Supplement. New York. Vol. 55.

— Some properties of the Radiation of Radio-active Bodies. Pp. 22862-22863.

— The Conundrums of Radium. Pp. 22863-22864.

- Lodge, Oliver. On electrons. Pp. 22898-22899.
- Hammer, William J. Radium and Other Radio-active Substances. Pp. 22904-22907.
- Nature. London. Vol. 67.*
- Mellor, J. W. The Thermal Energy of Radium Salts. P. 560.
- Lockyer, William J. S. Solar prominence and Spot Circulation, 1872-1901. Pp. 569-571.
- Harris, R. A. A New Theory of the Tides of Terrestrial Oceans. Pp. 583-584.
- Bonney, T. G. March Dust from the Soufrière. P. 584.
- Thomson, J. J. Radium. Pp. 601-602.
- Nature. London. Vol. 68.*
- Strutt, R. J. Energy Emitted by Radio-active Bodies. P. 6.
- Lockyer, William J. S. The Solar and Meteorological Cycle of thirty-five years. Pp. 8-10.
- Journal of Geology. Chicago. Vol. 2.*
- Burrows, Alvin T. The Chinook Winds. Pp. 124-125.
- Symons's Meteorological Magazine. London. Vol. 38.
- Joly, C. J. Irish Barograms of the Storm of February 26. Pp. 49-50.
- Journal of Geography. Chicago. Vol. 2.*
- Brown, Robert Marshall. Climatic Factors in Railroad Construction and Operation. Pp. 178-190.
- London, Edinburgh, and Dublin Philosophical Magazine. London. 6th Series. Vol. 5.*
- Townsend, John S. The Conductivity produced in Gases by the Aid of Ultra-Violet Light. Pp. 389-398.
- McLennan, J. C. Induced Radioactivity Excited in Air at the Foot of Waterfalls. Pp. 419-428.
- Wilson, Harold A. A Determination of the Charge on the Ions produced in Air by Röntgen Rays. Pp. 429-441.
- Rutherford, E. The Radioactivity of Uranium. Pp. 441-445.
- Rutherford, E. A comparative Study of the Radioactivity of Radium and Thorium. Pp. 445-457.
- Parks, G. J. On the Thickness of the Liquid Film formed by Condensation at the Surface of a Solid. Pp. 517-524.
- Trowbridge, John. On the Gaseous Constitution of the H and K lines of the Solar Spectrum, together with a Discussion of reversed Gaseous Lines. Pp. 524-529.
- Durack, J. J. E. On the Specific Ionization produced by the Corpuscles given out by Radium. Pp. 550-561.
- Rutherford, E. and Soddy, F. Condensation of the Radio-active Emanations. Pp. 561-576.
- Rutherford, E. and Soddy, F. Radioactive Change. Pp. 576-591.
- Ciel et Terre. Bruxelles. 24me année.*
- Prinz, W. Analyse complémentaire de la boue tombée en Belgique le 22 février 1903. Pp. 75-81.
- Hildebrandsson, H. H. Sur la circulation générale de l'atmosphère. Pp. 82-90.
- Hildebrandsson, H. H. Sur la circulation générale de l'atmosphère. Pp. 105-118.
- Comptes Rendus de l'Académie des Sciences. Paris. Tome 136.*
- Le Cadet, G. Étude de l'électricité atmosphérique au sommet du mont Blanc (4810m.) par beau temps. Pp. 886-888.
- Nordmann, Charles. Sur les propriétés magnétiques de l'atmosphère terrestre. Pp. 960-962.
- Annaire de la Société Météorologique de France. Paris. 51me année.*
- Angot, Alfred. Sur le calcul des moyennes et la variabilité de la température en France. Pp. 53-59.
- Thévenet, —. Recherches de thermodynamique sur la distribution des éléments météorologiques à l'intérieur des masses d'air en mouvement. Pp. 59-61.
- Annales de Chimie et de Physique. Paris. 7me séries. Tome 28.*
- Langevin, P. Recombinaison et mobilités des ions dans les gaz. Pp. 433-530.
- Archives des Sciences Physiques et Naturelles. Genève. 4me période. Tome 15.*
- Gautier, R. Observations météorologiques faites aux fortifications de Saint-Maurice pendant les mois de août, septembre, octobre et novembre 1902. Pp. 327-334.
- La Nature. Paris. 31me Année.*
- Gall, J. F. Station météorologique de la Schlucht. Pp. 275-276.
- Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften. Wien. IIa Abth., Band 111.*
- Meyer, Stefan. Notiz über das magnetische Verhalten von Europium, Samarium und Gadolinium. Pp. 38-41.
- Hann, J[ulius]. Die Schwankungen der Niederschlagsmengen in grösseren Zeiträumen. Pp. 67-186.
- Oppolzer, Egon R. v. Erdbewegung und Aether. Pp. 244-254.
- Stankewitsch, B. W. Magnetische Messungen, ausgeführt im Pamir im Sommer 1900. Pp. 276-295.
- Lampa, Anton. Der Gefrierpunkt von Wasser und einigen wässerigen Lösungen unter Druck. Pp. 316-332.
- Bendorff, Hans. Beiträge zur Kenntnis der atmosphärischen Elektricität. X. Ueber ein mechanisch registrierendes Elektrometer für luftelektrische Messungen. Pp. 487-512.

Das Wetter. Berlin. 20 Jahrgang.

Treitschke, Friedrich. Die Witterung in Thüringen im Jahre 1902. Pp. 73-82.

Frenbe, —. Ein Landwirtschaftlicher Wetterdienst. Pp. 82-92.

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— Die Sonnenflecke in ihrer Veränderlichkeit von 1749 bis 1901. Pp. 351-357.

— Ueber Methoden der Forschung in der Meteorologie. Pp. 359-364.

— Die mikroseismische Pendelunruhe und ihr Zusammenhang mit Wind und Luftdruck. Pp. 367-370.

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Pircher, J. Ueber die Haarhygrometer. Pp. 381-382.

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Seidel, H. Klima und Wetter auf den Marianen. Pp. 139-144.

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Wassmuth, A. Apparate zum Bestimmen der Temperaturänderungen. P. 146-161.

Illustrierte Aeronautische Mittheilungen. Strassburg. 7 Jahrgang.

Hergesell, —. Ueber Aufsteigen von geschlossenen Gummibalons. Pp. 163-168.

Zeitschrift der Gesellschaft für Erdkunde. Berlin. No. 3, 1902.

Woeikof, A. Das Warmwasser vor den Strassen von Gibralter und Bab-el-Mandeb. P. 220.

Mittheilungen von Forschungsreisenden und Gelehrten aus den Deutschen Schutzgebieten. Berlin. Band 16.

— Resultate der meteorologischen Beobachtungen in Deutsch-Südwestafrika für das Jahr Juli 1901 bis Juni 1902. [Abstract of article by Thomas.] Pp. 9-20.

Maurer, Hans. Zusammenstellungen von Monats- und Jahresmitteln von 34 Beobachtungsstationen. Pp. 20-108.

Wiener Luftschiffer-Zeitung. Wien. 2 Jahrgang.

— Ein neuer Winddruckmesser. Pp. 70-71.

Meteorologische Zeitschrift. Wien. Band 20.

Rosenthal, E. Die Szintillation der Fixsterne vom Standpunkt der synoptischen Meteorologie. Pp. 145-156.

Draenert, F. M. Zum Klima des Staates Ceará, Brasilien. Pp. 156-162.

Grundmann, G. Ueber die Ausmessung meteorologischer Photogramme. Pp. 162-168.

— James Glaisher. P. 170.

— Rainmund Prugger. P. 170.

Hergesell, —. Vorläufiger Bericht über die internationale Ballonfahrt vom 9. Januar 1903. Pp. 171-172.

Hergesell, —. Vorläufiger Bericht über die internationale Ballonfahrt am 5. Februar 1903. Pp. 172-173.

Früh, J. Ueber die Natur des Staubes vom 21. bis 23. Februar 1903. Pp. 173-175.

— Staubfüllte Atmosphäre über dem Ozean in W. der afrikanischen Küste. Pp. 175-176.

— Die Beobachtungen auf der Zugspitze im Jahre 1902. P. 176.

Maurer, H. Zur Frage der "gestrengen Herren" oder "Eismänner." Pp. 176-178.

Wolfer, A. Provisorische Sonnenflecken-Relativzahlen. P. 178.

H[ann], J[ulius]. Zum Klima von Dahomey. P. 178.

— Der Sturm von 26-27 Februar 1903 in England. Pp. 178-180.

— Sturm in Frankreich am 2. und 3. März. P. 180.

Hann, J. Ergebnisse 43 jähriger Regenmessungen auf der Insel Malta. Pp. 180-181.

— Luftdruckveränderungen infolge von Vulkanausbrüchen. Pp. 181-182.

Schwalbe, G. Eduard Hoppe: Regenergiebigkeit unter Fichtenjungwuchs. Pp. 182-183.

— Merkwürdige meteorologische Phänomene in Australien. P. 183.

— Staubströme in Australien. P. 183.

Margules, M. Ueber rasche Erwärmungen. Pp. 183-187.

— Meteorologische Beobachtungen zu Paramaribo. P. 187.

Friesenhof, —. Leuchtende Wolken. Pp. 187-188.

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— Dürre in Südaustralien. P. 189.

— Gewitter bei heiterem Himmel. P. 189.

THE WATER EQUIVALENT OF SNOW ON GROUND.

By CHARLES A. MIXER, Civil Engineer, Rumford Falls, Me.

In a letter of March 7, 1903, to Dr. H. C. Frankenfield, in charge of the River and Flood Service, Mr. Charles A. Mixer, resident engineer of the Rumford Falls Power Company, at Rumford Falls, Me., on the Androscoggin River, communicates the following interesting observations:

"My usual gaging of the snow on the ground consists in

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simply getting a correct and full sample of the snow on the ground and then melting it to get the water equivalent. The sample is secured by forcing a cylinder down to the ground, then shoveling down around it and inserting a sheet metal bottom and lifting it out. On my voluntary observer's report for March, 1900, there is given my first report of such measurements. On account of the unusual depth of snow on the ground at a late date and its peculiar condition, I was led to make some measurements that season: these were on March 17, depth of snow, 38 inches; water equivalent, 10.49 inches; on the 31st the snow had settled to 20 inches, and the water equivalent was 9.84 inches. This represents ordinarily about 100 inches of winter snowfall, and is practically the whole winter's precipitation, to be added, when it runs off, to the greater spring precipitation. Think of this depth of water covering the surface waiting to be released, and imagine what would happen if all of it should run at once into the little river channels! This must have an important bearing on flood warnings. By gaging the snow, one can know in advance what may be expected, modified of course by considerations as to whether the snow melts and evaporates in the sunshine only or melts with the added help of a warm rain. I have kept up the measurements since my first observation in 1900, especially at the end of winter when the snow begins to go off.

"Another thought that led me first to such observations was my need of a sufficient explanation for certain monthly records of run off amounting to from 200 per cent to 500 per cent of the monthly precipitation. Of course this applies only to northern rivers, but the higher the altitude and latitude the more it means. At my present station, this season, the snow on the ground in an open place where my gage stands, measured on the 28th of February, 1903, only 19 inches, and gave 6.29 inches of water, but above us in the woods the snow is reported to be 4 to 6 feet deep. In connection with some of the northern rivers, this water that is held back, being stored in congealed form and waiting to go down, should be taken into consideration in order to get some advanced information."

RIVER FLOODS AND MELTING SNOW.

By CHARLES A. MIXER, Civil Engineer, Rumford Falls, Me., dated April 25, 1903.

The minimum discharge of the Androscoggin River occurs in February, and during the winter season the run off is controlled almost entirely by the temperature. The annual average run off is about 55 per cent of the annual precipitation, and varies monthly between 200 and 400 per cent of the total monthly precipitation. While trying to explain to myself the large run off in the springtime of from 2 to 4 times the monthly precipitation, I was led to consider the heavy covering of snow and noted it as an accumulated precipitation held in cold storage, to be released by warm weather; sometimes its release is accelerated, and its volume is increased by warm rains. In March, 1900, the depth of snow on the ground was more than the average, and being very heavy I thought to determine its water equivalent. I obtained a sample by pressing a cylinder down to the ground, digging around the outside, inserting a bottom of sheet metal and lifting out the sample. The result was entered on my monthly report as a voluntary observer, viz, March 17, snow on the ground, 38 inches; water equivalent, 10.49 inches. By the 31st the sun had settled the snow nearly one-half, and it was much heavier; the measurement gave 20 inches of snow and the equivalent water, 9.84 inches. I have made more such gagings since then, but not regularly. I have not usually made them systematically, but only at what seemed to be the end of the winter season. I have described the method to a number of others, but have never found one who had heard of it or tried it. Of course, in some parts of the country, men have no opportunity to see a large accumulation of snow or the remainder of three